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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,638	10/19/2001	David Patrick Magee	TI-32986	8619

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EXAMINER	
JAMAL, ALEXANDER	
ART UNIT	PAPER NUMBER
2614	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/044,638	MAGEE ET AL.	
	Examiner	Art Unit	
	Alexander Jamal	2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ ~~Responsive~~ to communication(s) filed on *19 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ ~~Since this application~~ is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *54-74* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Based upon the submitted amendment (1-19-2007), the examiner notes that claims 1-53 have been cancelled and claims 56,65 have been amended.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 54,60,65,73, 56,62,67, 57,59,63,68,71,72,74,70** rejected under 35 U.S.C. 103(a) as being unpatentable over Youssefmir (6795409).

As per **claim 54,** Youssefmir discloses a beamforming method for a communications system where the system receives a signal that comprises data tones (second type) and training tones (first type) (Fig. 5C,5D). The combiner 229 of Fig. 2 performs channel estimation on the received signal in order to compensate for multipath (Col 7 line 60 to Col 8 line 12). The system estimates interference (noise) (Col 8 lines 1-12) and uses the estimates to allow the beamformer to mitigate the interference (Col 27 lines 1-11) via the smart antenna processing strategy. The smart antenna weighting parameters may be determined (computing beamforming) based on optimizing a

parameter of an error signal (Col 6 lines 1-22) where the error signal is determined from a received training signal or tone (Col 27 lines 40-50) (Col 27 line 65 to Col 28 line 10). Since the error signal is used to mitigate the effects of interference and multipath, the error signal comprises a noise (interference) estimate and a channel (multipath) estimate. However, Youssefmir does not specify that the estimates based off a particular training tone are applied to the closest data tone.

Youssefmir's interference and multipath estimates may be determined from training tones in a time division or frequency division system (Col 29 lines 1-10). As such, It would have been obvious to one of ordinary skill in the art at the time of this application that the estimates made at a particular instant in time or a particular frequency on a particular tone should be applied to the closest data tones (in time or frequency) for the purpose that the training tone noise estimate (and hence the noise mitigation) will be the most accurate for the nearest data tone estimates (ie. you would not estimate noise @ 10KHz and apply it to signaling @ 10MHz).

As per **claims 60,65, the** claims are rejected for the same reasons as the claim 54 rejection. Youssefmir discloses the means within a communications receiver to perform the method of claim 53. The system inherently comprise a training tone extractor for the purpose of retrieving and processing the training tones.

As per **claim 73,** the claim is rejected for the same reasons as the claim 54 rejection. The system comprises an antenna (Fig. 2a,2b). The system inherently comprises an A/D converter for the purpose of converting the received analog waveforms

into digital format in order to be processed by a DSP (Col 5 lines 1-6). The system may be an FDD system and processed in the frequency domain (Col 29 lines 1-10). There are less training tones than data tones (Fig. 5c,5d).

As per **claim 56,62,67,** they are rejected for the same reasons as claim 54.

As per **claim 57,59,63,68,** they are rejected for the same reasons as the claim 54 rejection. The received tones inherently require indexing (such as clocking or frame formatting for example) and extracting steps (and means) for the purpose of being able to retrieve, separate, and process the individual tones (both data and training).

As per **claim 71,** the system may be implemented as a DSP (Col 5 lines 1-6).

As per **claims 72,74,** they are rejected as per the claim 73 rejection.

As per **claim 70,** Youssefmir discloses the communications receiver as per the rejection above, but does not specify integrating any parts of the receiver.

It would have been obvious to one of ordinary skill in the art at the time of this application to integrate as many components of the system as possible for the advantage of improved manufacturability.

3. **Claims 55,58,61,64,66,69 are** rejected under 35 U.S.C. 103(a) as being unpatentable over Youssefmir (6795409) as applied to claim 54,60,65, and further in view of Raleigh (6006110).

As per **claim 55,61,66,** Youssefmir discloses that a known signal may be used to form an error signal (noise/channel estimate) used in the beamforming (Col 6 lines 5-25), but does not give the specifics of the estimating process.

Raleigh discloses a beamforming system where interference (noise) is estimated in order to optimize the beamforming (Col 8 lines 10-45). The noise estimator computes the difference (error signal) between the received training signal and the previous training signal (Col 15 lines 25-40), calculates the variance and covariance (Col 11 lines 46-50), and then time averages the covariance (Raleigh Col 15 lines 1-10). It would have been obvious to one of ordinary skill in the art at the time of this application to use a known technique in the system of Youssefmir for the purpose of estimating the noise (error signal) used in the beamforming process.

As per **claims 58,64,69,** Raleigh's system calculates soft decisions and noise to signal (SINR) for each of the tones (RALEIGH: Col 14 lines 10-21).

Response to Arguments

4. Applicant's arguments with respect to claims 54-74 have been considered but are not persuasive.

As per applicant's argument that Youssefmir does not disclose a channel estimate to compensate for multipath, examiner disagrees. Examiner contends that Youssefmir does disclose that the combining stage performs spatial processing and combines the beams in a way that mitigates multipath and interference (Col 8 lines 1-5). Examiner notes Col 6 lines 10-20, where it is disclosed that a known training signal may be used to form an 'error' signal. This error signal is used by the system to determine the antenna strategy and determine weighting parameters. This procedure in the smart antenna system is used to mitigate multipath and interference, so the error signal is the estimate of the multipath and interference (channel estimate and noise estimate).

As per applicant's arguments that Youssefmir does not disclose taking noise estimates on training tones, examiner notes Col 6 lines 5-15 that disclose a training signal embedded within the data signal that is used to produce the error signal (estimate).

As per applicant's argument that estimation and calculation of weighting parameters for the smart antenna is not part of the beamforming, examiner disagrees. Examiner contends that the weighting and combination of waveforms **is** part of the beamforming and that the estimation (error signal) is used for the broad term 'computing beamforming' (as per applicant's independent claim language).

As per applicant's argument that it would not have been obvious for Youssefmir's system to utilize training tones nearest each data tone in order to derive a noise estimate, examiner notes that Youssefmir already discloses estimating noise on training tones, in a system where data/training tones are spread out over the spectrum (FDMA,FDD), or are placed at relative moments in time (TDD,TDMA). Examiner contends that one skilled in

the art, who was using noise measurements from training tones would, realize that the training tone nearest a data tones (in time or frequency, depending on the system) would give the best estimation of what noise was being applied to said data tone. As per applicant's comment that there is no support in Youssefmir to use training tones to derive the 'multipath estimates' examiner notes the above cited sections of Youssefmir.

As per applicant's comment that examiner is using hindsight in saying that the error signal comprises a multipath and noise estimate. Examiner maintains that the error signal being referred to by Youssefmir is the 'error' in the received signal. The 'error' is only caused by the channel properties or interference (noise) as those are the only things that will act on the signal from when it is transmitted to when it is received. The 'error' is an 'estimate' of what happens to the signal when it is travels through the transmission channel.

As per applicant's argument that Youssefmir does not disclose the 'indexing' function. Examiner contends that any system that demodulates multiplexed data requires a mechanism to identify which bits are data and which are overhead (the training tones for example). Any mechanism that is used to identify the type of each symbol may be considered an 'index'. Youssefmir already discloses analyzing embedded training tones (Figs. 4,5). The tones must be 'indexed' in order to be recovered analyzed, and acted upon by the system. Again, Youssefmir already discloses the separate (data, training) signal-types that are combined to form the transmitted/received signal. Any system that receives, and acts upon the combined signal **requires** an 'indexing' function in order to separate, identify, and act on the data.

As per applicant's comments that Youssefmir does not disclose a 'tone extractor', examiner notes that Youssefmir discloses multiplexed signals that are received, separated, and then acted upon (noise/channel estimates on the training tones). In the same manner that the signals must be 'indexed' the signals require a 'tone extractor' to separate and recover the individual signal types. A 'tone extractor' is considered to be any mechanism that separates the data from the overhead/training signaling. Youssefmir already discloses receiving and acting upon the training signals, therefore they must be extracted from the incoming combined signal, and therefor the system inherently comprises a 'tone extractor'.

As per applicant's arguments regarding claims 63,68 examiner notes the above responses regarding the obviousness of using the nearest training tone for each data tone and also the inherent indexing function that is required to identify, separate, and act on the received signal. Examiner reads the indexing function as a 'noise selection function' when the indexing function is used to facilitate the noise estimation on the training signals.

As per applicant's arguments regarding claim 73, examiner notes that Youssefmir discloses that his smart antenna system may be used in an FDMA, CDMA, TDMA system. These are known systems that require a 'preprocessing system' in order to receive and recover the data. In the case of the frequency division multiplexing protocols, the received signal must be acted upon in the frequency domain to recover the signal.

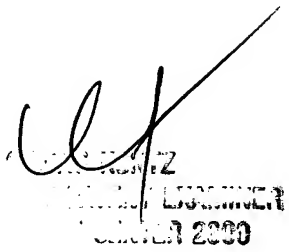
As per applicant's comment that Youssefmir does not disclose using estimates from one type of tone to perform beamforming on another type of tone, examiner contends that the training tones are one type of tone and the data tones are another type and Youssefmir discloses using estimates from one type of tone to perform beamforming on another type of tone as noted above.

As per applicant's argument that Raleigh does not disclose the noise estimation on training tones, examiner notes Col 7, lines 40-50.

As per applicant's arguments that claim 55 recites two independent indications, applicant is not correct. Claim 55 claims a first indication and then a second indication of the first indication. The indications are not independent. Furthermore, regarding the Raleigh reference, the variance indication inherently requires (as per the definition of variance) an indication of a difference between a current tone and a previous tone (applicant's claimed first indication).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 571-272-7498. The examiner can normally be reached on M-F 9AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 571-272-7499. The fax phone numbers for the organization where this application or proceeding is assigned are **571-273-8300** for regular communications and **571-273-8300** for After Final communications.



AJ
April 12, 2007